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(54) Sub-munition.

(57) The invention relates to a subwarhead which is arranged to be separated from a missile, for example a carrier shell or the like, over a target area, the subwarhead comprising an active part (4), a target detector (5) and an arrangement which imparts to the subwarhead a rotation for scanning of the target area in a helical pattern during the descent of the subwarhead towards the target area. The target detector is arranged displaceably in order to allow a free view at the side of the active part. Two diametrically situated aerofoils (1, 2) are arranged to be pivotable from a folded-in position, in which the aerofoils connect with the outer surface of the subwarhead, to a 90° folded-out position, in which the two aerofoils form a braking area for the rate of descent of the subwarhead. The two aerofoils are pivotably arranged via a double joint (4, 5 ; 6, 7 ; 8, 9).

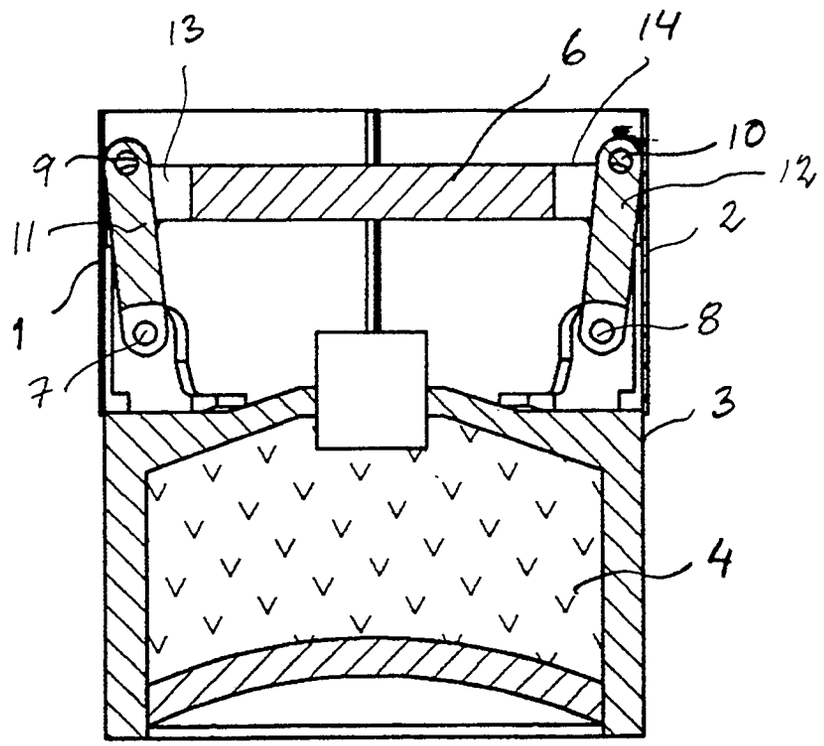

Fig.1

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The present invention relates to a subwarhead arranged to be separated from a missile, for example a carrier shell or the like, over a target area, the subwarhead comprising an active part, a target detector and an arrangement which imparts to the subwarhead a rotation for scanning of the target area in a helical pattern during the descent of the subwarhead towards the target area. Such a subwarhead is previously described in the Swedish patent 8601423-0.

Characteristic of the subwarhead described in the patent is the fact that the target detector is arranged pivotably on a bearing shaft which is parallel with the line of symmetry of the active part in order to allow pivoting out of the target detector from a folded-in position, in which the optical axis of the target detector coincides with the line of symmetry of the active part, to a folded-out position, in which the optical axis of the target detector is parallel with the line of symmetry of the active part, in order to allow a free view by the target detector at the side of the active part, and furthermore that an aerofoil is pivotably arranged on a bearing shaft which is also parallel with the line of symmetry of the active part in order to allow pivoting out of the aerofoil from a folded-in position to a folded-out position at the side of the active part.

By means of an expedient aerodynamic design of the subwarhead and the braking area of the detector and the aerofoil, a suitable rate of descent of the subwarhead and furthermore a driving moment, which imparts to the subwarhead its rotation, around the axis of spin are obtained. This is brought about without assistance from a parachute, which is an advantage since the parachute takes up space. Within the available space in a carrier shell, an increased space can instead be made available for the active part itself.

Although the subwarhead described above has proved to have good characteristics as far as rate of descent and scanning rotation are concerned, it has become desirable to be able to increase the braking area further. This can be the case, for example, when it is desired to use heavier active parts. The braking area of the target detector and aerofoil is limited to the cross-sectional area of the cylindrical subwarhead, which can result in the rate of descent becoming too high with the existing size of the braking area if the weight of the active part is increased at the same time.

In Swedish patent application 8903474-8, a subwarhead is described, in which the braking area has been made considerably greater. Characteristic of the subwarhead is the fact that two diametrically situated aerofoils are each arranged, on their own shaft situated in a plane which is perpendicular to the axis of symmetry of the active part, to be pivotable from a folded-in position, in which the aerofoils connect with the outer surface of the subwarhead, to a 90° folded-out position, in which the two aerofoils form a braking area for the rate of descent of the subwarhead.

The aerofoils are in this case made of an elastically flexible material so that, when they pivot out from their folded-in position, they are simultaneously bowed out into a mainly straight or slightly curved surface.

The advantage of the construction described above, in addition to the greater braking area, is that the two aerofoils can be made comparatively thin, which is favourable as far as weight is concerned. The aerofoils can be made of titanium, for example, and curved so that they have a given radius in their folded-out position.

The curvature can be varied and the aerofoils can be of different length, in which respect further parameters are obtained for varying the flight characteristics.

The aim of the present invention is to further improve the characteristics of a subwarhead of the type mentioned above, and in particular to design the subwarhead so that the size of the active part can be increased.

A further aim of the invention is to design the folding-out mechanism in a robust manner without for this reason encroaching upon the space for the active part.

The features of the invention emerge from the characterizing part of Patent Claim 1.

The invention is described below in greater detail with reference to the attached drawings which show an example of how a subwarhead according to the invention can be designed.

In Figures 1 and 2, the subwarhead is shown in its folded-in position, and in Figures 3 and 4 in its folded-out position.

The subwarhead is assumed to have been separated from a canister in a carrier shell. The carrier shell can be one of 15.5 cm calibre, for example, which has been fired from a field artillery piece in conventional manner in a ballistic trajectory towards a target area. In order to give the subwarhead a controlled movement of scanning of the target area, that is to say a controlled rotation and rate of descent, two diametrically situated aerofoils 1, 2 are arranged to be pivotable from a folded-in position, see Figures 1 and 2, in which the aerofoils connect with the outer surface 3 of the subwarhead, to a folded-out position, in which the two aerofoils form a braking area, see Figures 3 and 4.

The Subwarhead comprises an active part 4 and a target detector 5 which is arranged displaceably from a folded-in position in the stirrup-like superstructure 6 on the active part to a folded-out position, see Figure 4, in which it has a free view at the side of the active part. The active part and the target detector are of types known per se and are therefore not described in greater detail here.

The aerofoils themselves 1, 2 can be made in the manner which is indicated in the Swedish Patent Application 8903474-8 which is mentioned in the

introduction. In contrast with the latter, however, the aerofoils are each suspended in a double joint, which consists of two folding-out shafts, on the hand a shaft 7, 8 arranged in the lower part of the stirrup-like superstructure 6 on the active part and on the other hand a shaft 9, 10 fastened in the underside of the aerofoil 1, 2 itself. The two shafts are connected via an arm 11, 12.

The advantage of this arrangement, compared with pivotability about only one folding-out shaft as in the previously known subwarhead, is that the folding-out shafts 7, 8 in the stirrup-like superstructure 6 can be positioned as low as possible on the subwarhead and in spite of this provide increased width of the aerofoils and consequently the greater braking area which is sought.

A further advantage of pivotability about two shafts (double joint) is that, in their folded-in position, the aerofoils connect with the upper part of the subwarhead, see Figure 1, and do not surround the active part 4 itself. Although the aerofoils are comparatively thin, the aerofoils still require a given space which can now instead be used to increase the diameter of the active part 4. Moreover, the aerofoils 1 and 2 can now, in their folded-in position, be used as a cover for the upper part of the subwarhead and protect the target detector, detonator etc. which are positioned there.

The shafts 7, 8 are positioned in a plane which is perpendicular to the line of symmetry of the active part. The shafts 9, 10 also are positioned in a plane which is perpendicular to the line of symmetry. In the folded-in position, see Figure 1, this plane is situated above the plane with the shafts 7, 8, while the shafts 9, 10 follow a circular trajectory to the folded-out position, in which the shafts lie in a plane which essentially coincides with the plane, in which the fixed bearing shafts are arranged.

In the folded-in position, the shafts 9, 10 are situated slightly outside the bearing shafts 7, 8 in relation to the axis of symmetry of the subwarhead. The bearing shafts 9, 10 are suspended on the undersides of the aerofoils 1, 2 at approximately a quarter of the distance from the inner edge, respectively upper edge in the folded-in position, of the aerofoils.

The linking arms 11, 12, which connect the two bearing shafts in the double joint, are comparatively wide, see Figure 4, for reasons of durability. The stirrup-like superstructure 6 is provided with diametrically situated recesses 13, 14 for the arms 11, 12 in the folded-in position.

The aerofoils are folded out from their folded-in position by means of the rotational forces. Expediently, a damping element is installed so that the aerofoils are stopped gently in the folded-out position and the risk of oscillations is reduced. Furthermore, locking elements are arranged in the inner joint 7, 8 in order to lock the aerofoils in the folded-out position, for example a simple snap lock or locking hook.

Claims

1. Subwarhead arranged to be separated from a missile, for example a carrier shell or the like, over a target area, the subwarhead comprising an active part, a target detector and an arrangement which imparts to the subwarhead a rotation for scanning of the target area in a helical pattern during the descent of the subwarhead towards the target area, and the target detector being arranged displaceably in order to allow a free view at the side of the active part, and two diametrically situated aerofoils (1, 2) being arranged to be pivotable from a folded-in position, in which the aerofoils connect with the outer surface of the subwarhead, to a 90° folded-out position, in which the two aerofoils form a braking area for the rate of descent of the subwarhead, characterised in that the two aerofoils (1, 2) are pivotably arranged via a double joint (4, 5; 6, 7; 8, 9).

2. Subwarhead according to Patent Claim 1, characterised in that the double joint comprises a first bearing shaft (7, 8) in the housing of the subwarhead and a second bearing shaft (9, 10) arranged on the aerofoil (1, 2), the two bearing shafts being connected via an arm (11, 12).

3. Subwarhead according to Patent Claim 2, characterised in that the bearing shafts (7, 8, 9, 10) lie in planes which are perpendicular to the axis of symmetry of the subwarhead.

4. Subwarhead according to Patent Claim 3, characterised in that the second bearing shafts (9, 10), in the folded-out position of the aerofoils, are positioned in essentially the same plane as the first bearing shafts (7, 8) while, in the folded-in position of the aerofoils, they lie in a plane which is situated above the plane, in which the first, fixed bearing shafts (7, 8) are situated.

5. Subwarhead according to Patent Claim 4, characterised in that the second bearing shafts (9, 10), in the folded-in position, are situated slightly outside the first bearing shafts (7, 8) in relation to the axis of symmetry of the subwarhead.

6. Subwarhead according to Patent Claim 1, characterised in that the aerofoils (1, 2), in their folded-in position, enclose the upper part of the subwarhead.

7. Subwarhead according to Patent Claim 6, characterised in that the second bearing shafts (9, 10) are arranged on the undersides of the aerofoils at a distance from the upper or, in the fol-

ded-out position, inner edge of the aerofoils.

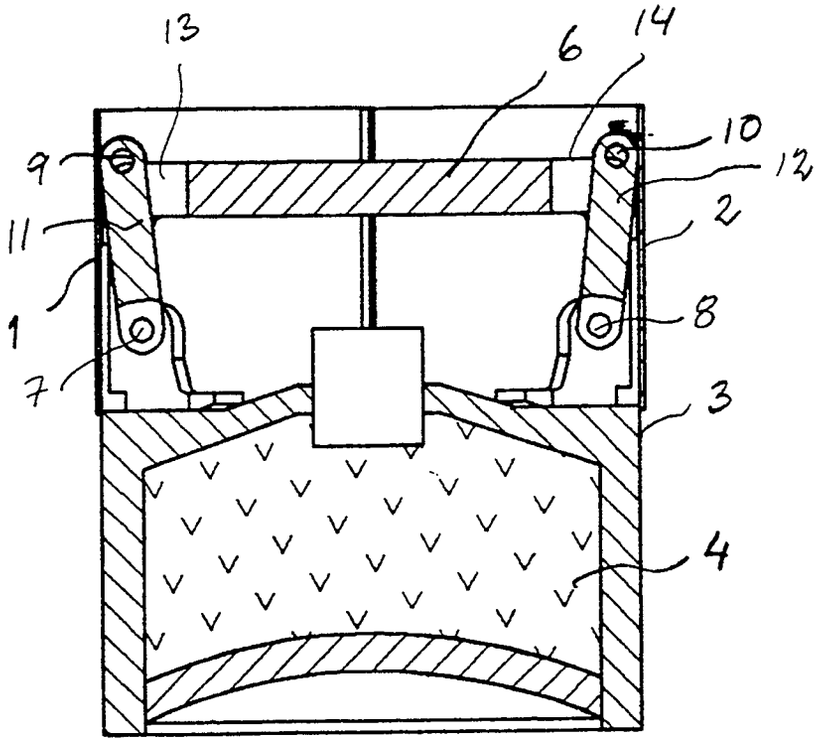

Fig.1

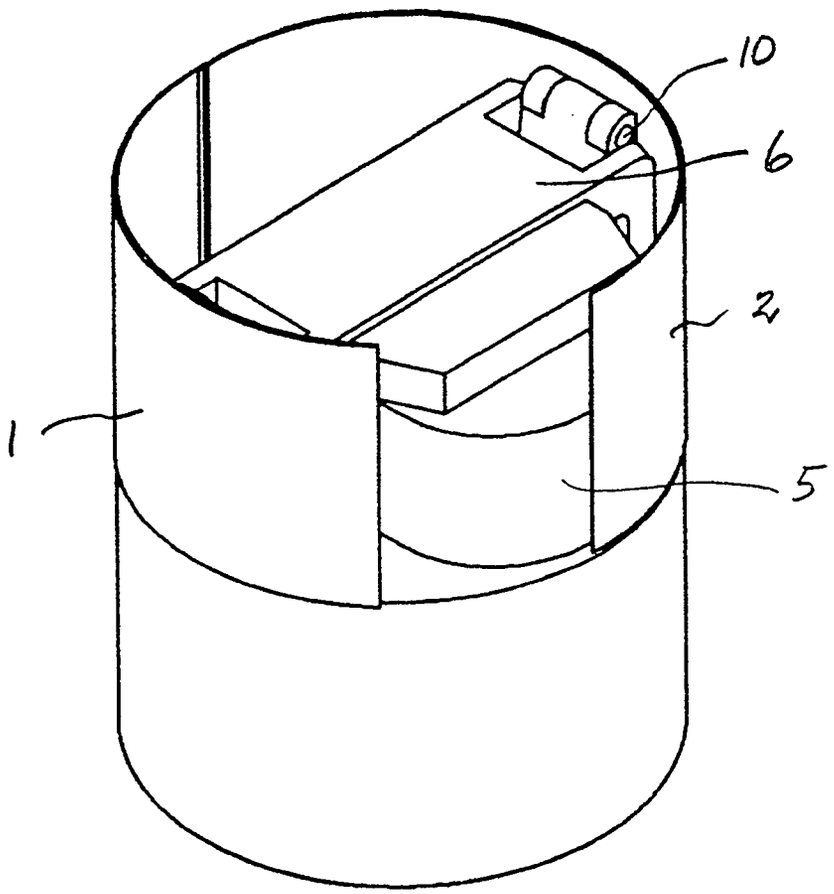

Fig.2

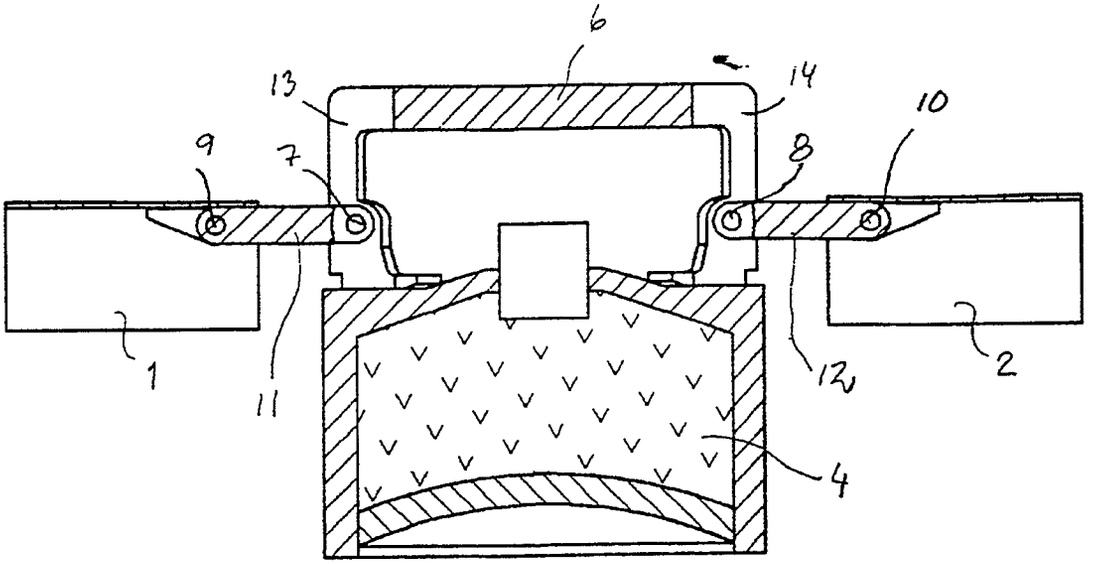

Fig.3

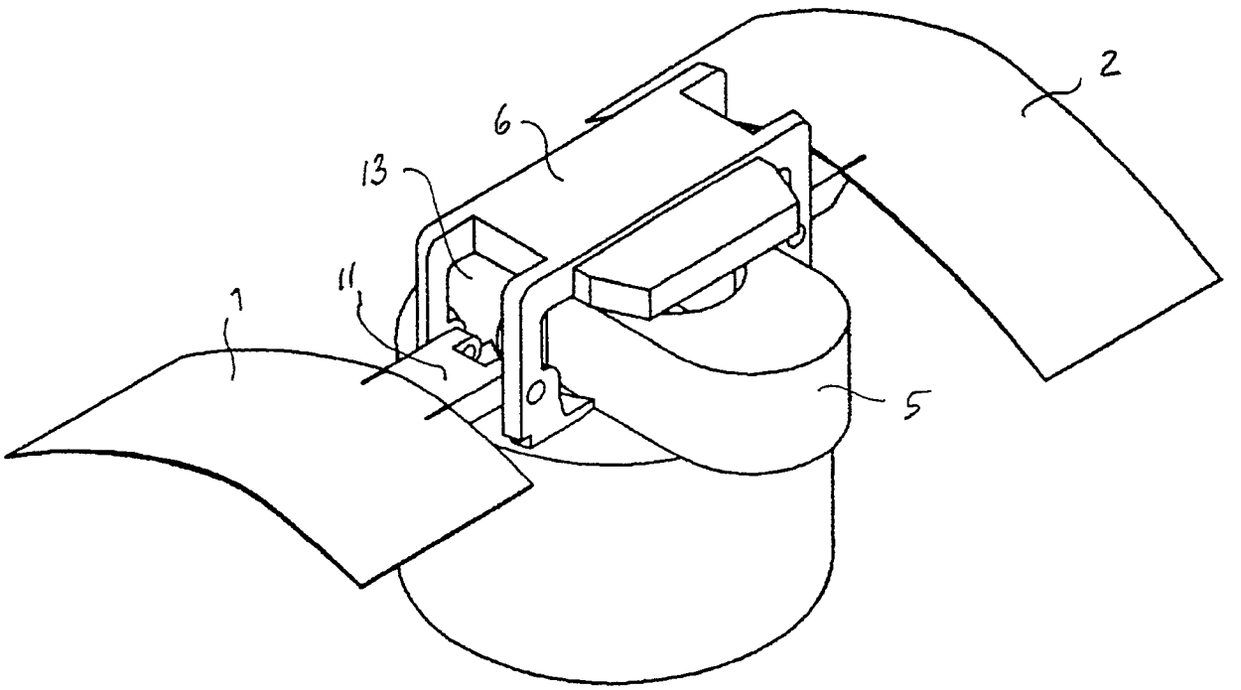

Fig.4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91850074.5

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	GB - A - 2 153 982 (DYNAMITNOBEL AG) * Totality * --	1	F 42 B 10/50 F 42 B 12/58
A	EP - A2/A3 - 0 252 036 (AKTIE BOLAGET BOFORS) * Totality * ----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F 42 B 10/00
F 42 B 12/00
F 42 C 13/00
F 41 G 7/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	19-07-1991	KALANDRA

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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